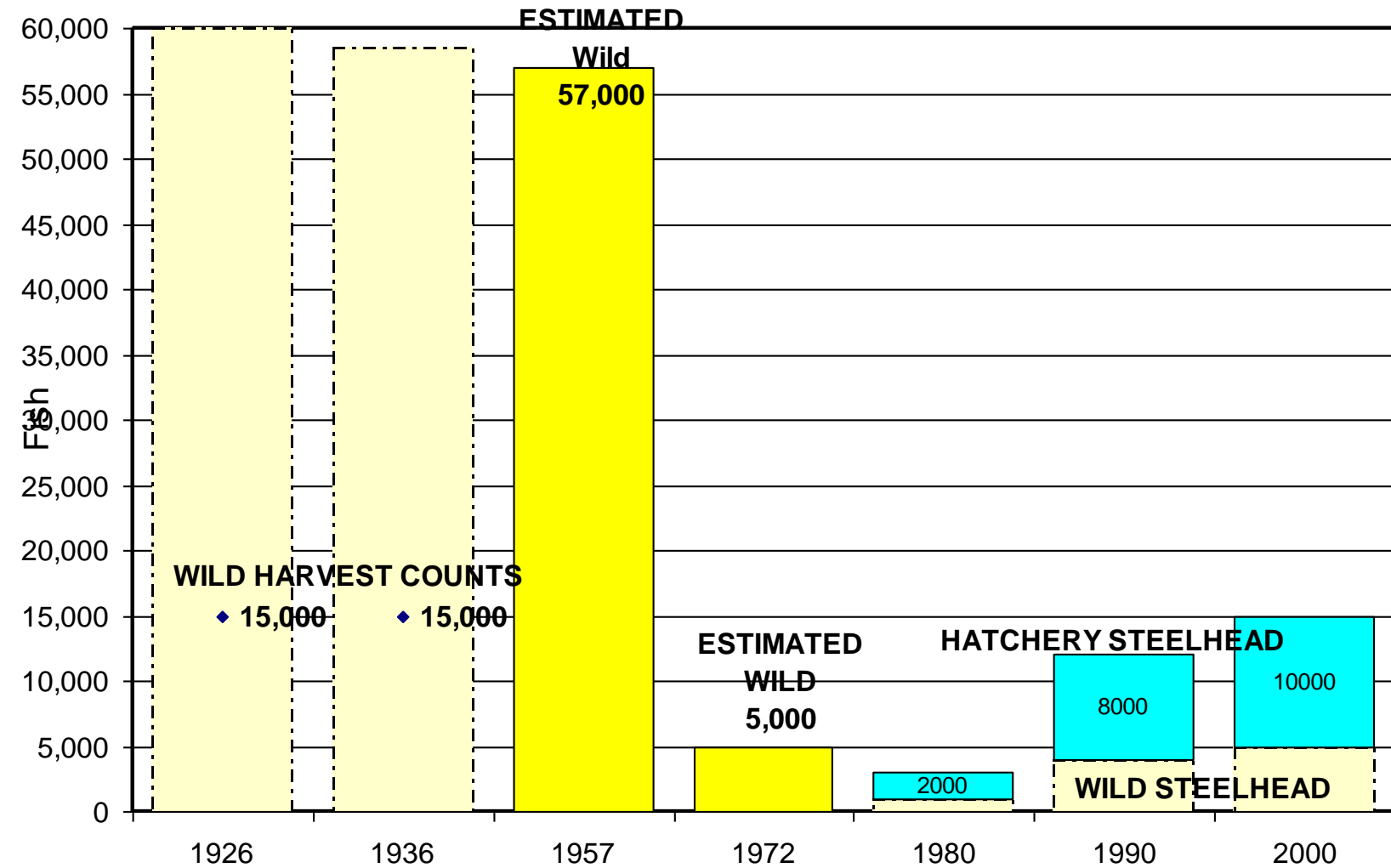


Salmon and Steelhead Conservation through adaptive management of water levels in the Jenner estuary

NOAA'S National Marine Fisheries Service

STEELHEAD COUNTS, ESTIMATES AND RETURNS



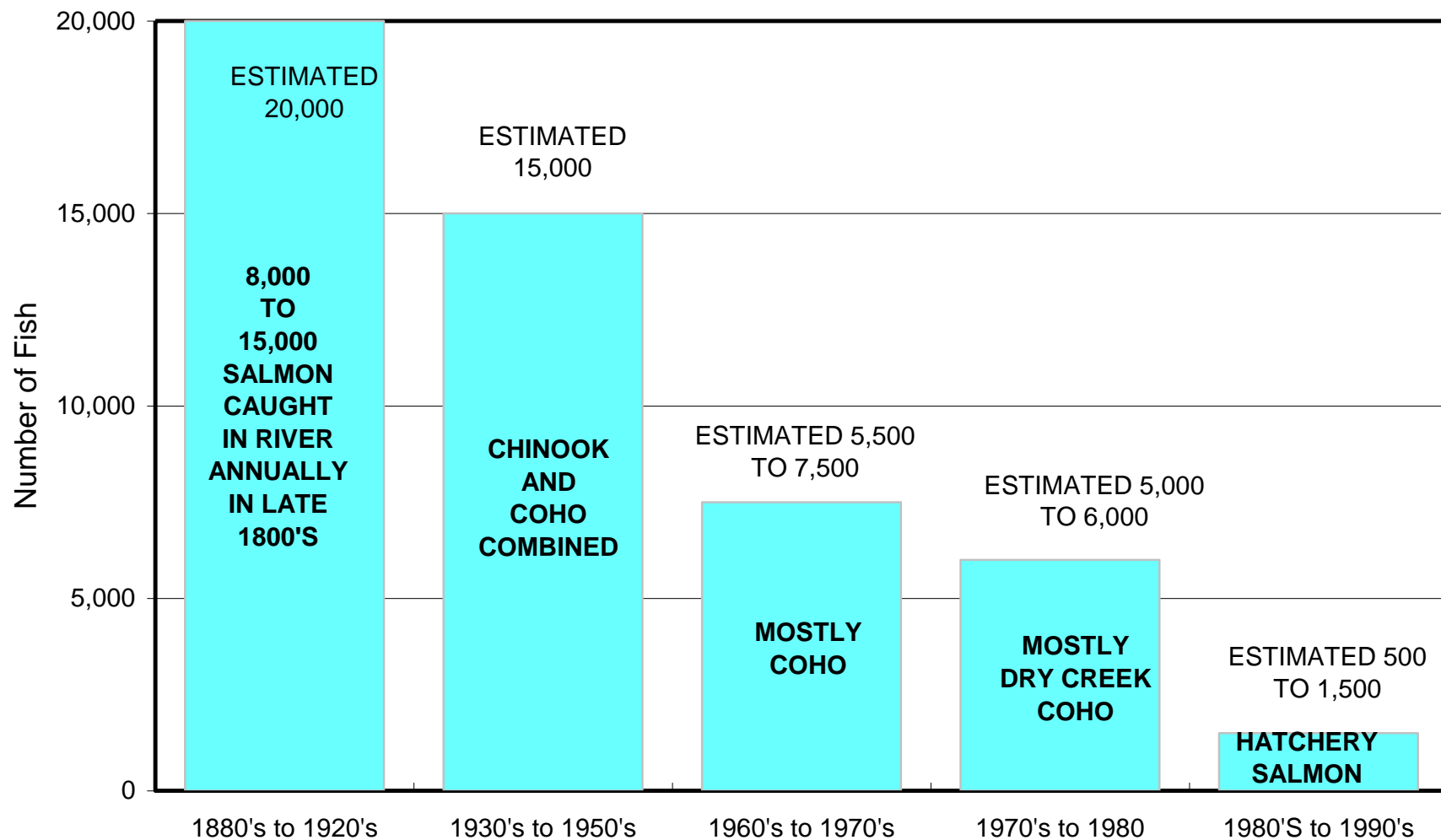
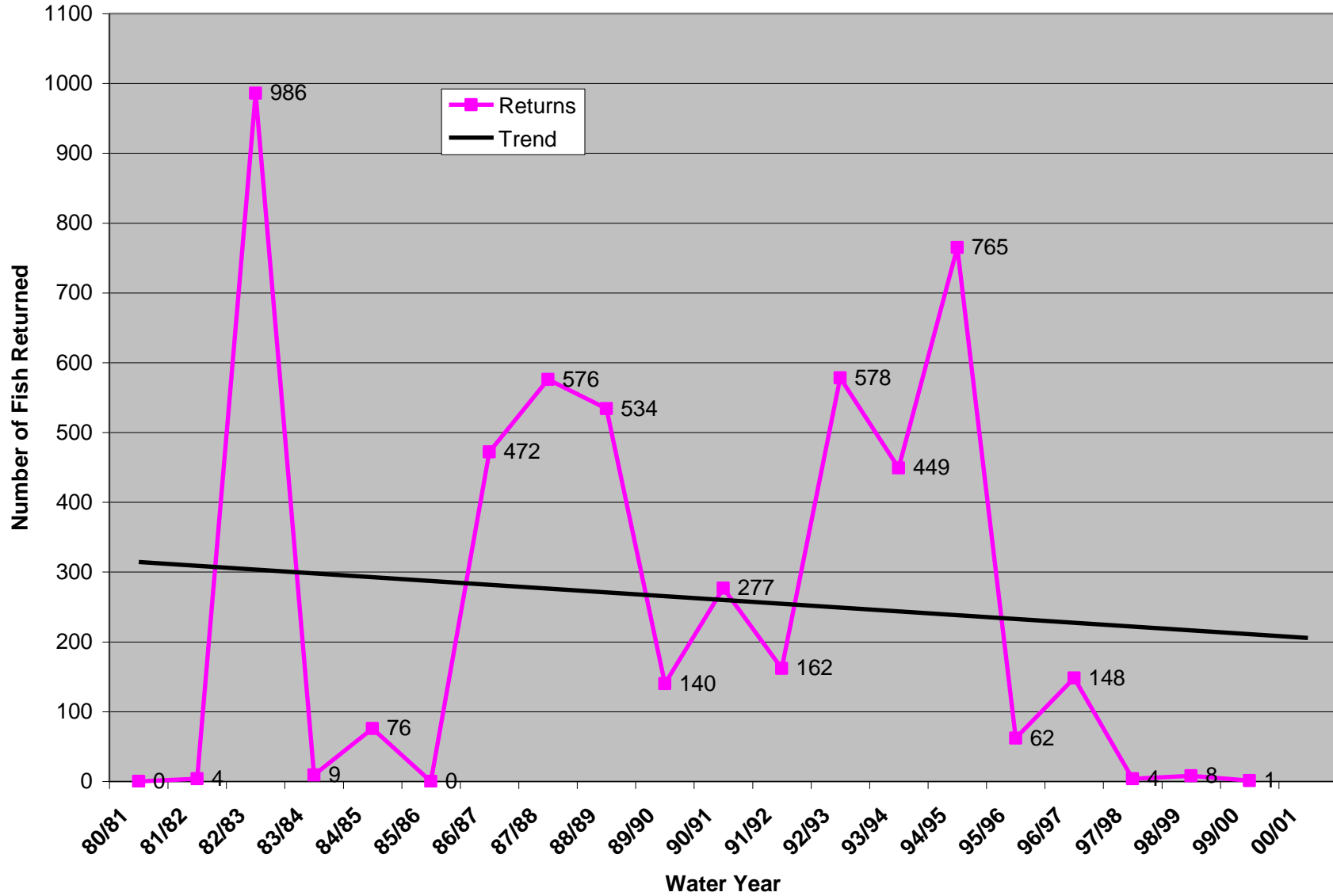
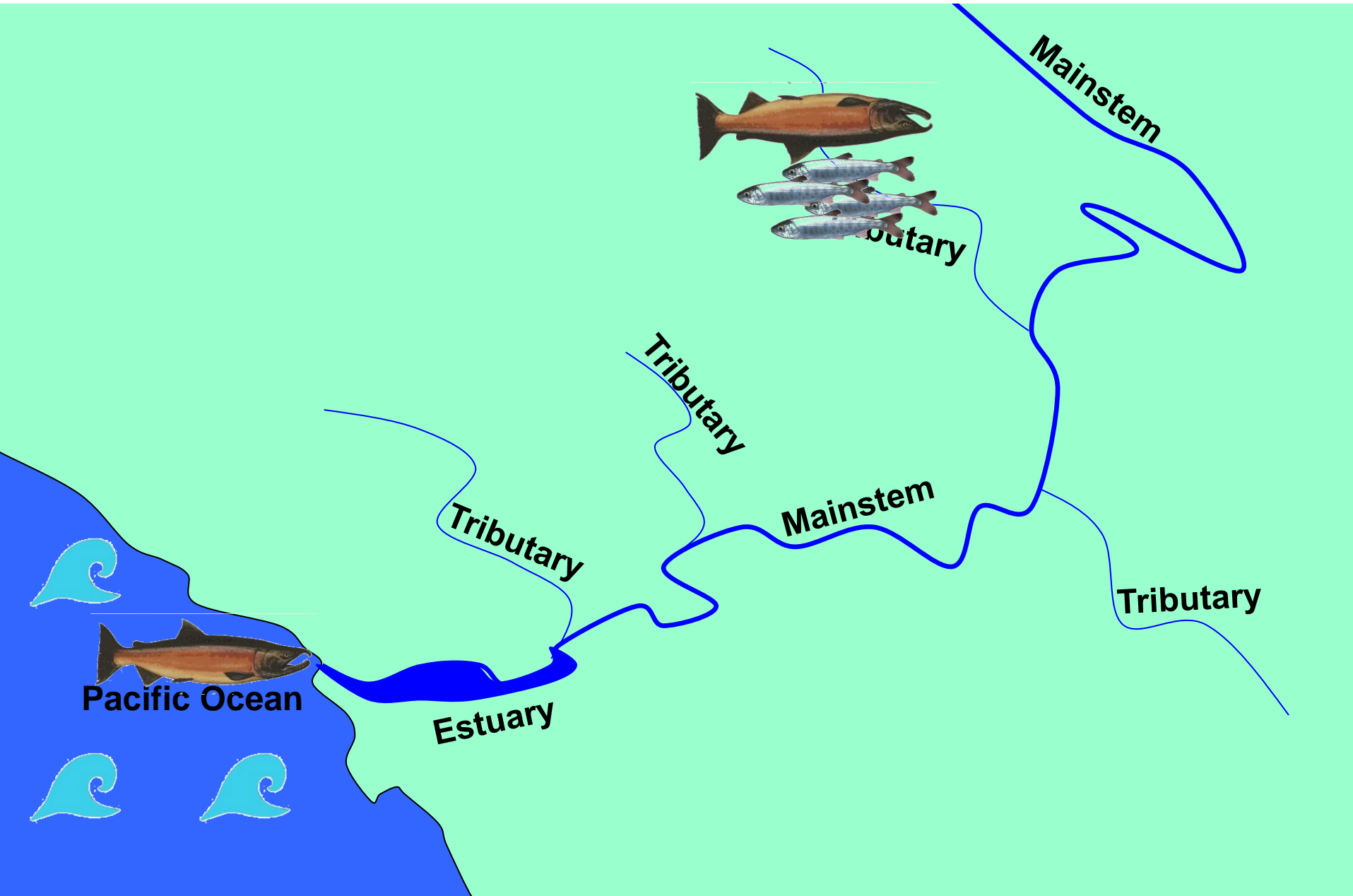


Figure 1: Hypothetical escapements to the Russian River for all species of salmon. [Estimates based on conservative expansion of U.S. Bureau of Fish and Fisheries (1888), Warm Springs Hatchery return numbers, anecdotal CDFG reports, and CDFG Hatchery Returns.]

Warm Springs Hatchery COHO Returns



Conceptual Map of the Russian River watershed



Why the decline in salmon and steelhead populations?

Habitat Degradation

Sedimentation



Water Quality Impairment



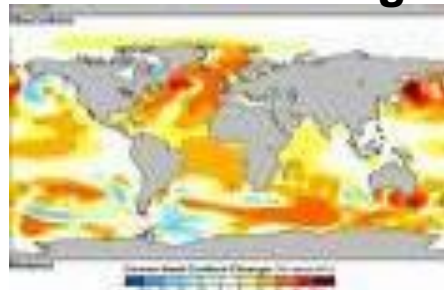
Water Diversions **Impaired estuary function**



Channelization



Ocean Warming

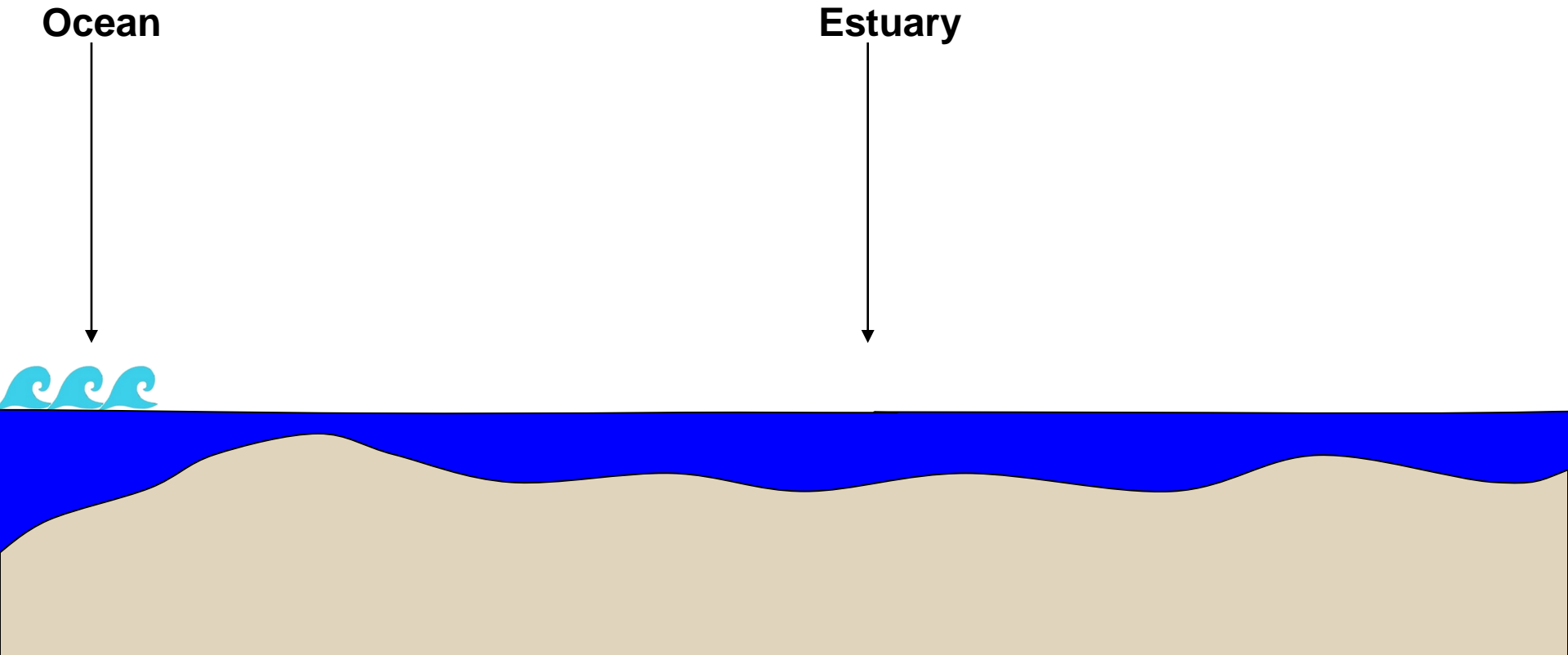


Causes

- Roads
- Agriculture
- Timber Harvest
- Rural and Urban Development
- Dams
- Flood Control Projects
- Climate Change

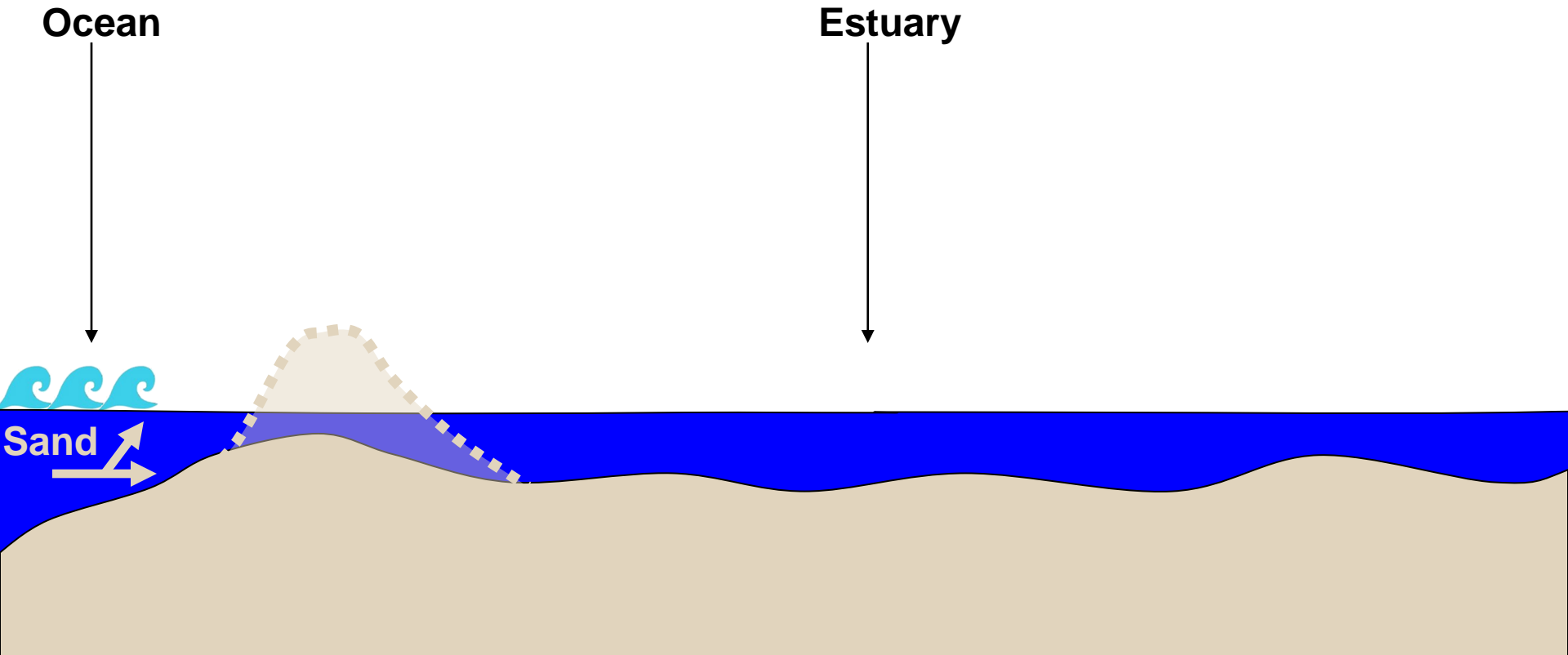
Estuary Dynamics and Management

1. In Mediterranean climates, barrier beaches naturally close estuaries to form lagoons



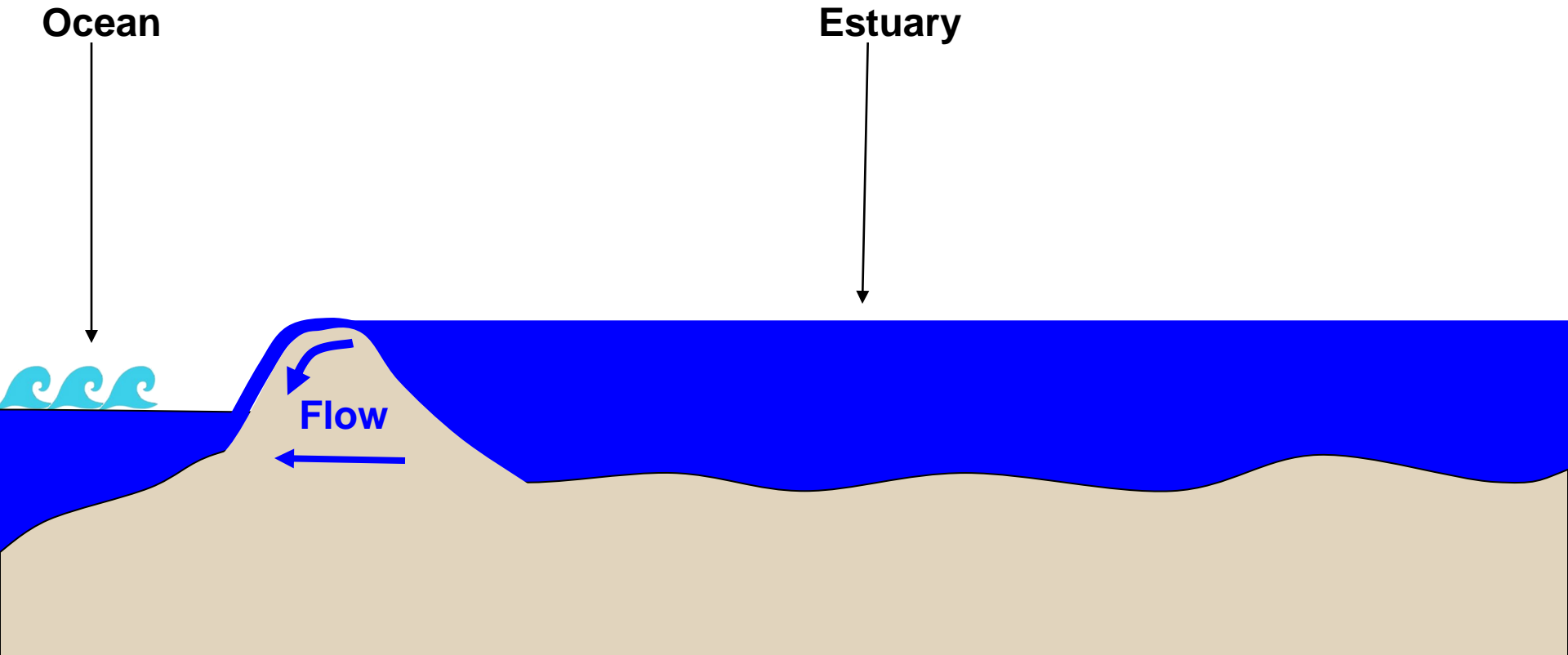
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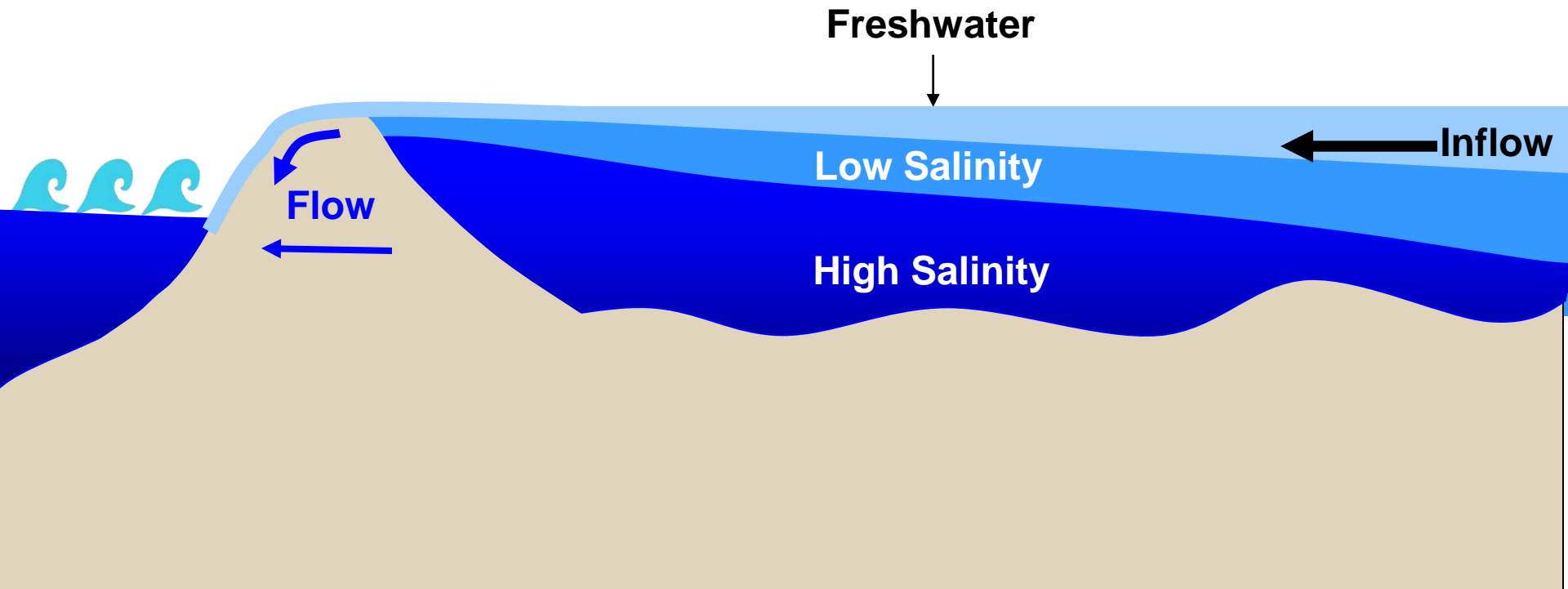
Estuary Dynamics and Management

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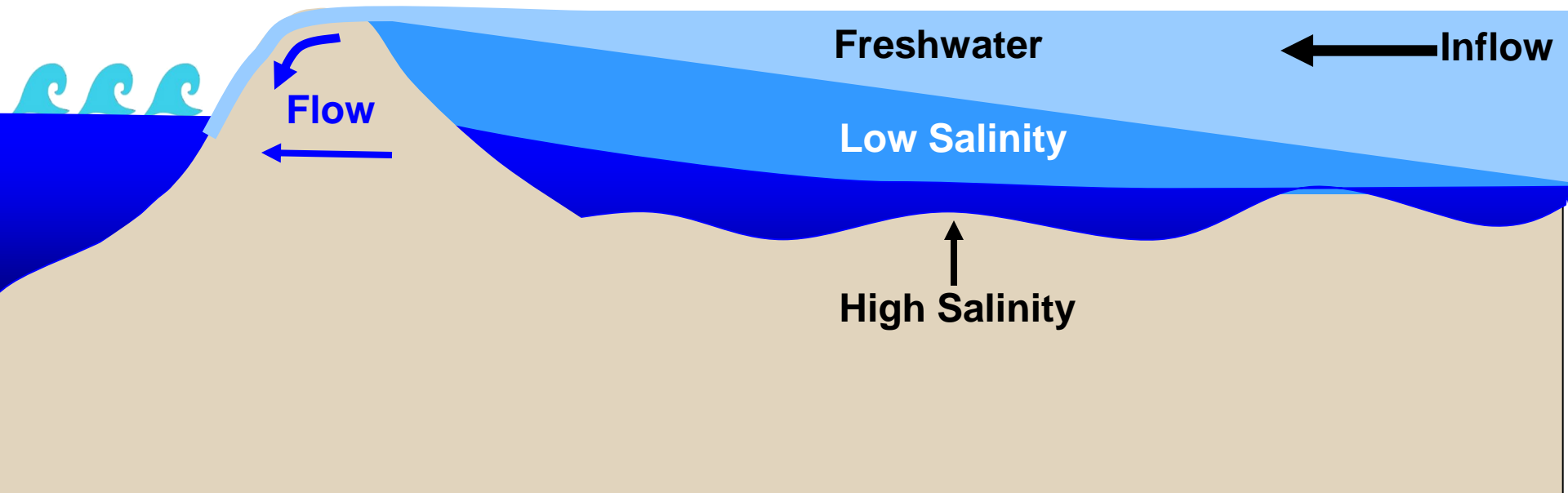
Estuary Dynamics and Management

2. When barrier beaches close, estuaries become freshwater lagoons or low salinity brackish systems (oligohaline)



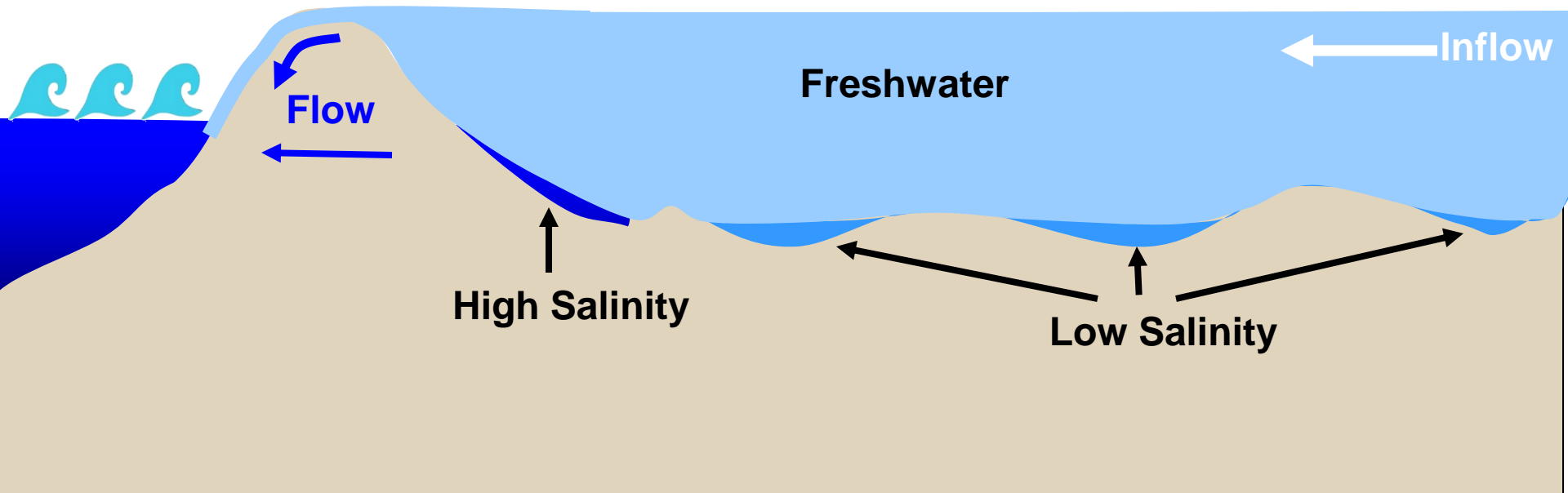
Estuary Dynamics and Management

2. When barrier beaches close, perched estuaries become primarily freshwater lagoons...



Estuary Dynamics and Management

2. When barrier beaches close, perched estuaries become primarily freshwater lagoons...



Estuary Dynamics and Management

3. Given moderate natural inflows, lagoons form highly productive rearing habitats for steelhead and salmon

In Scott Creek:

"While comprising less than 5% of the total stream area, the estuary may be the most important habitat for steelhead growth in this watershed" (Hayes et al. 2008)

In Pescadero, San Gregorio, and Waddell Creeks:

"The high numbers and/or large sizes of steelhead reared in the lagoons during years of freshwater conversion demonstrate that these lagoons can potentially contribute the majority of steelhead smolts produced in these small coastal watersheds." (Smith 1990)

<i>River/Creek</i>	<i>Estuary Type</i>	<i>Area (1000 m²)</i>		<i>Steelhead Density (#/m²)</i>	<i>Reference</i>
Scott	Freshwater	8		0.25	Bond 2006
Mattole	Freshwater	180		0.15	Zedonis 1992
Pescadero	Freshwater/ Stratified	30		0.30	Smith 1990
San Gregorio	Freshwater	43		0.25	Smith 1990
Waddell	Freshwater	18		0.67	Smith 1990
Navarro*	Stratified	377		0.024	Cannata 1998
Russian	Managed as open – saline	585		Very low	SCWA 2006
Garcia*	Open – largely saline	200		Very low	Higgins 1995
Albion	Open – largely saline	160		Very low	Maahs and Cannata 1998
Smith	Open – largely saline	1,171		0.005-0.01	Quinones and Mulligan 2005

Estuary Dynamics and Management

4. A disproportionately large number of adult steelhead returning from the ocean are reared in freshwater lagoons.

In Scott Creek:

"Estuary reared steelhead show a large survival advantage and comprise 85% of the returning adult population, despite being between 8% and 48% of the juvenile population" (Bond 2006)

"The majority of fish reaching typical steelhead ocean entry sizes were estuary-lagoon reared, which indicates a disproportionate contribution of this habitat type to survival of Scott Creek steelhead." (Hayes et al. 2008)

Recovery of Species

Restoration of Viable Populations

Viable populations:

- Good Abundance

- Good population growth rate

- Good population spatial structure

- healthy genetic & ecological diversity